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ABSTRACT

This research brief documents higher education's infrastructure needs, examines the effectiveness of existing financing vehicles and methods, and explores new approaches and methods of financing and long-term investment for buildings, equipment, and facilities. Currently, the bulk of capital funding occurs at the state level, and to a lesser extent, at the institutional level, yet this brief calls for a more collaborative funding effort, with the federal government joining this partnership. It is noted that current financing vehicles are inadequate to fund the necessary overhaul of higher education facilities, but that with structural changes such as those suggested in the brief, the federal government could work with states and institutions to enhance the status of higher education facilities. It is suggested that two federal strategies could leverage investments by other sectors: first, a matching grant program could provide funds to help higher education institutions reduce the $60 billion backlog; and second, the federal government could include colleges and universities in two initiatives for financing national infrastructure, a tax-exempt infrastructure bond, and an infrastructure trust fund. Contains a 14-item bibliography. (GLR)

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Higher Education Infrastructure: The Federal Role

Jamie P. Merisotis, Susan M. Chun and Eileen O'Brien

For much of the past three decades, institutions of higher education have deferred the maintenance needs of their physical facilities. During this period, demographic trends have resulted in a sharp increase in demand for higher education. However, while overall spending for higher education increased to meet this demand, spending on facilities and equipment did not increase proportionately. Not only was maintenance of existing buildings deferred, but some facilities experts have questioned the quality of many buildings constructed during the 1960s. Years of underfunding have led to deteriorating facilities and accumulating backlogs of deferred maintenance. Only recently have institutional administrators realized the full magnitude of the problem.

This research brief documents higher education's infrastructure needs, examines the effectiveness of existing financing vehicles and methods, and explores new approaches and methods of financing and long-term investment for buildings, equipment, and facilities. Currently, the bulk of capital funding occurs at the state level, and to a lesser extent the institutional level, yet this brief calls for a more collaborative funding effort, with the federal government joining this partnership.

HIGHLIGHTS

- In 1988, the capital renewal and replacement needs of colleges and universities were estimated at $60 billion by the Association of Physical Plant Administrators (APPA). This figure will most likely continue to grow at an accelerated rate.
- "Urgent needs," described by facilities managers as priority repairs or renovations, account for about one-third ($20.5 billion) of the total $60 billion.
- In 1988, for every $1.00 spent on needed maintenance for all higher education facilities, $4.00 was deferred. More recent research on scientific and research facilities suggests that this deferral rate is increasing.
- Depreciation of existing structures will likely increase, as total enrollment is projected to increase from 12.8 million to 13.4 million between 1988 and 2000.

IMPLICATIONS

Although data regarding the rate of deferred maintenance for all higher education institutions has not been updated since the APPA study, trends indicate that the rate has increased significantly since 1988. A consensus of urgency regarding physical plant needs seems to be emerging among higher education administrators.

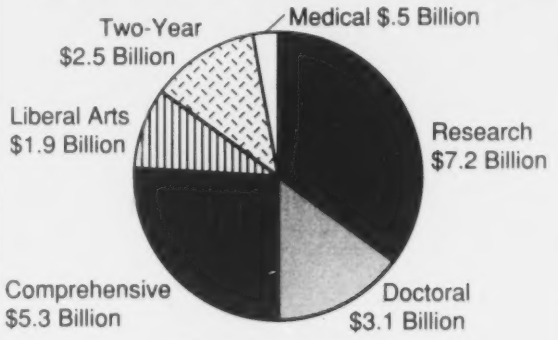
Current financing vehicles are inadequate to fund the necessary overhaul, just as they were unable to prevent the current levels of deferred maintenance from occurring. All parties with a stake in higher education should seriously pursue alternative methods of financing to ensure that this situation will be ameliorated, and avoided in the future.

Repairing and upgrading higher education facilities should be an integral part of the overall effort to address the deteriorated condition and urgent situation of the nation's infrastructure.

Jamie P. Merisotis, formerly an independent consultant on higher education financing issues, is currently executive director of the National Commission on Responsibilities for Financing Higher Education (NCRFHE). Susan Chun was formerly a research assistant for Mr. Merisotis and Eileen O'Brien is a research analyst at the American Council on Education. The views expressed in this brief do not represent those of the NCRFHE.

Figure 1

Urgent Needs for Facility Improvement/ Replacement, by Institution Type, 1988



Total: $20.5 Billion

Source: Association of Physical Plant Administrators of Universities and Colleges, *The Decaying American Campus: A Ticking Time Bomb.* Washington, D.C.,1989.

Table 1

Total Facility Space, 1988

Institutional Type	Percent of Total	Gross Square Feet
Research	24%	720.0
Doctoral	10%	300.0
Comprehensive	27%	810.0
Liberal Arts	11%	330.0
Two Year	24%	720.0
Medical	4%	120.0

Source: Association of Physical Plant Administrators of Universities and Colleges, *The Decaying American Campus: A Ticking Time Bomb.* Washington, D.C.,1989.

As the nation begins to improve its economic competitiveness, higher education will play a crucial role. Although there must be a concerted effort from all sectors, only the federal government, with its panoramic perspective on the problems facing the country, can mold an effective, long-term policy for infrastructure investment from the piecemeal approach that has thus far been ineffectual.

With structural changes such as those suggested in this brief, the federal government can significantly alter the picture of higher education facilities.

INTRODUCTION

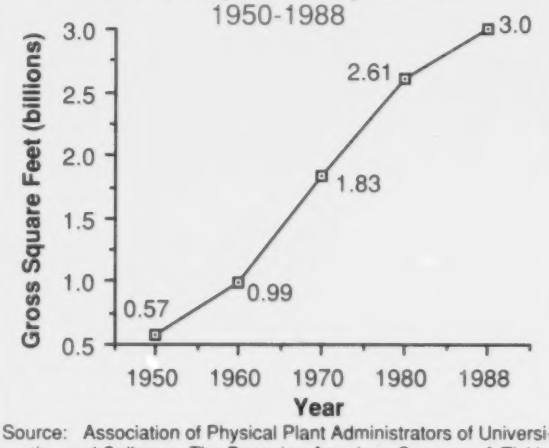
Nationwide attention is starting to focus on the infrastructure needs of our country. Traditionally, the term infrastructure has referred to transportation (highways, mass transport, water transport), aviation, water resources, and water treatment. However, as our country's economy becomes more and more information-based, postsecondary education also becomes a more integral part of the infrastructure of such an economy. The concept of infrastructure—as the backbone of our nation's global competitiveness and economic health—will always be intricately tied to the products of our higher education institutions.

The Status of Facilities Needs

- In 1988, the capital renewal and replacement needs of colleges and universities were estimated at $60 billion by the Association of Physical Plant Administrators (APPA).[1] These needs most likely will continue to grow at an accelerated rate.
- "Urgent needs," described by facilities managers as priority repairs or renovations, accounted for about one-third ($20.5 billion) of the total $60 billion (figure 1).[2]
- In 1988 for every $1.00 spent on needed maintenance for all higher education facilities, $4.00 was deferred. More recent research on scientific and research facilities suggests that this deferral rate is increasing.
- Regrettably, data regarding the rate of deferred maintenance for all higher education institutions has not been updated since the APPA study. However, the National Science Foundation (NSF) found the deferral rate for research facilities had increased from $3.60 in 1988 to $4.25 in 1990 (NSF, 1990). With this and other evidence, it is reasonable to assume that the $4.00 deferral rate for all higher education facilities has increased as well.
- Although in 1988 $6 billion was required to address urgent facilities needs, only $1.2 billion was budgeted. (These budgeted expenditures were in addition to ongoing operation and maintenance expenditures.) Combined with the evidence regarding an increased deferral rate, it is likely that the severity and extent of urgent facility needs have grown.
- Furthermore, depreciation of existing higher education structures likely will continue to increase, as enrollment is projected to increase from 12.8 million to 13.4 million between 1988 and the year 2000 (National Center for Education Statistics, 1989).
- In 1987, the average institution had more facilities under construction than under renovation. Thus, not only are extant buildings developing maintenance needs, but these newly constructed buildings will add to the maintenance load in the future.
- As institutions attempt to remedy their deferred maintenance problems, they may find it more difficult to finance facility projects for several reasons:
  - Provisions made in the tax code in 1985 limit each institution to $150 million in tax-exempt

Figure 2

Total Campus Facility Growth
1950-1988



Source: Association of Physical Plant Administrators of Universities and Colleges, *The Decaying American Campus: A Ticking Time Bomb*. Washington, D.C.,1989.

Table 2

Average Age of Building
By Institution Type, 1988

Instituional Type	Education and General (age in years)	Auxiliary (age in years)
Research	36	29
Doctoral	38	35
Comprehensive	29	23
Liberal Arts	52	45
Two Year	16	21
Medical	24	16

Source: Association of Physical Plant Administrators of Universities and Colleges, *The Decaying American Campus: A Ticking Time Bomb*. Washington, D.C.,1989.

non-hospital bonds outstanding at any one time (this has resulted in some institutions being shut out of the tax-exempt market);

— These tax code changes may affect the overall growth in gift income from individuals, foundations, and corporations, though the long-term effect on giving cannot be fully determined;

— State funding for higher education is likely to decrease as state governments struggle to meet the skyrocketing costs of health care, prisons, and other long-term budget concerns.

How Needs Have Changed over the Last Two Decades

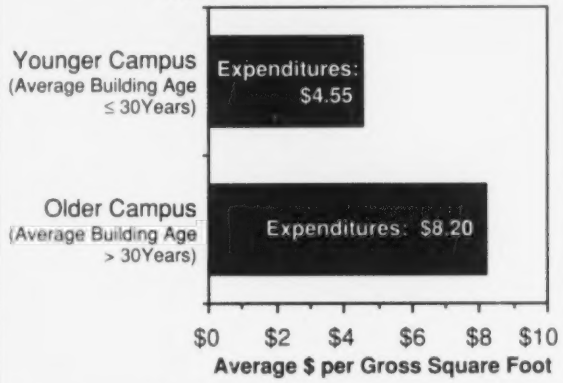
- Since 1950, college and university facility space has more than quintupled to more than 3 billion gross square feet (table 1 and figure 2).
- The total number of higher education institutions grew by more than 90 percent, from 1,800 in 1950 to 3,500 in 1990 (NCES, 1991).
- Between 1955 and 1974, new institutions (primarily public two-year institutions) opened at a rate of one every two weeks (APPA, 1989).
- One-third of the higher education physical plant is now 30 or more years old, and almost two-thirds are 20 or more years old (table 2). Buildings older than 30 years have an 80 percent greater urgent need than those that are younger (figure 3).
- As early as 1974, 20 percent of college and university space was in need of renewal, replacement, or demolition.[3]
- Inflation and energy costs during the 1970s and early 1980s squeezed college and university budgets, taking a severe toll on facility maintenance.
- Aggregate operation and maintenance (O&M) expenditures have fallen as a percentage of overall educational and general (E&G) expenditures: in 1930 they represented 16 percent of E&G expenditures; in 1940 and 1950, 13 percent; since 1960, 10 percent to 11 percent (APPA, 1989).
- Colleges and universities have tried to contain their physical plant budgets in recent years. The number of maintenance and service workers employed at universities has shrunk since 1975, while all other employment categories have grown.[4]
- New federal and state government standards for fire and safety codes, handicap accessibility, asbestos removal, care of laboratory animals, etc., are demanding a greater portion of limited facility funds.
  — For example, a 1990 APPA survey found that the average research institution had a backlog of $3.7 million in compliance costs for federal regulations on access for individuals with disabilities.[5]

Current and Long-Term Needs

- According to the National Association of College and University Business Officers, a typical college or university would require $25 million to upgrade its facilities to meet all the needs of its current educational programs (September 1987).
- The 1989 APPA study found that classroom, laboratory, and office and library space were the four priorities for construction and renovation cited most frequently by facilities managers.
- Those research universities that spend more than 5 percent of their current fund E&G expenditures on O&M have about 20 percent fewer urgent needs than other research universities (figure 4).

Figure 3

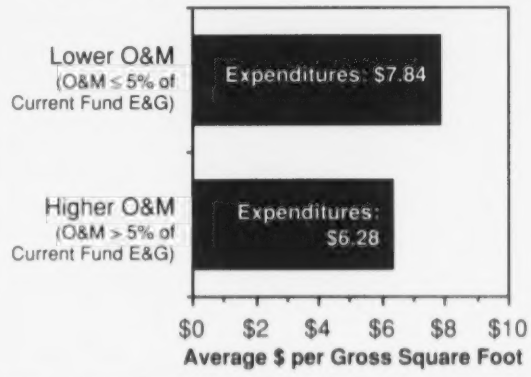
Urgent Needs Relative to Building Age for Research Universities



Source: Association of Physical Plant Administrators of Universities and Colleges, *The Decaying American Campus: A Ticking Time Bomb.* Washington, D.C.,1989.

Figure 4

Urgent Needs Relative to O&M Expenditures for Research Universities



Source: Association of Physical Plant Administrators of Universities and Colleges, *The Decaying American Campus: A Ticking Time Bomb.* Washington, D.C.,1989.

- A 1986 report from the Government-University-Industry Research Roundtable estimated that the unmet national need for new construction and renovation of research universities and colleges will range from $5 to $20 billion over the next 10 to 20 years.
- In a 1990 survey, 36 percent of college and university presidents identified deferred maintenance as a key campus issue over the next five years (*Campus Trends*, 1990). This was up considerably from only 14 percent the year before.
- Buildings for educational institutions cost 15 percent to 30 percent more than most non-educational buildings. Three main reasons for this are: 1) education and research programs require more complex designs and extensive systems; 2) educational buildings must adhere to campus building aesthetics and government regulations; 3) university buildings are built for longer life than commercial/industrial buildings, resulting in a greater concern for life-cycle costs as opposed to low first costs (figure 5). Therefore, better quality requires increased initial costs.

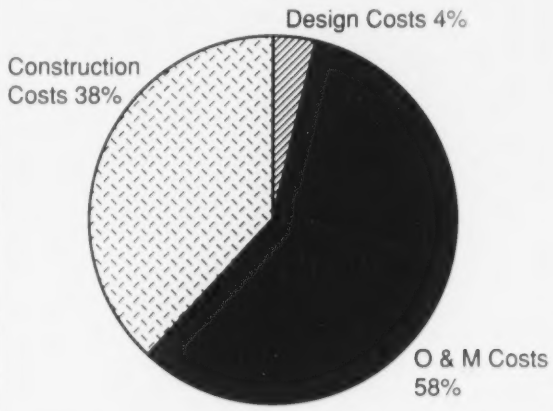
The National Infrastructure Scene

Just as higher education has become an integral part of our economy's infrastructure, the deteriorating condition of higher education facilities is symbolic of the overall decay in our national infrastructure. An overview of the condition of national facilities follows.

- The Report of the Private Sector Advisory Panel on Infrastructure Financing (1987) cited Congressional Budget Office (CBO) and Joint Economic Committee estimates that there will be a shortage of $240 billion to $448 billion in funding for infrastructure initiatives nationally by the year 2000.
- In 1987, nonmilitary public infrastructure was valued at $1.2 trillion, compared with private nonresidential capital equal to $4.1 trillion (CBO, 1991).
- According to the Advisory Panel Report, combined annual federal, state, and local investment in infrastructure declined from 3.5 percent of gross national product (GNP) in 1967 to 2.7 percent of GNP in 1983.
- In 1985, federal support for infrastructure was $28.5 billion (23 percent of the discretionary non-defense budget, or about 3 percent of the total federal budget). However, a large portion of that was taken from the Highway Trust Fund, and spent on transportation.[6]
- The change in the federal role for national infrastructure has mainly been one of "piecemeal pragmatic adaptations," rather than a coherent approach or overall design. Two noteworthy historical trends characterize this change.
  - — First, though federal spending for infrastructure has remained at about 3 percent of GNP for 15 years with only a slight decline, this steady aggregate share does not show the shifts in the nature and the relationship of the sources and recipients of federal funds. For most of the time since 1967, federal highway spending has formed the bulk of federal investment in infrastructure. The Highway Trust Fund, which is the largest source of federal revenue for national infrastructure, is generated from user-related taxes such as those levied on motor fuel and trucks. When highway outlay is removed from the total federal outlay, one sees that the federal contribution for national infrastructure actually has decreased since 1977.[7]
  - — Second, financial responsibility to meet infrastructure needs has shifted to local and state

Figure 5

Total Life Cycle Costs



Source: Kershner, Earl Gene."Why Do Buildings Cost So Much?" *NACUBO Business Officer*. April 1987.

governments. In 1983, state and local governments' annual spending in public works investment reached $63.6 billion, compared with annual federal spending of $25.5 billion in these areas (Advisory Panel Report, 1987). Of the $63.6 billion, more than two-thirds ($43 billion) was for operation and maintenance.

- Several means of financing national infrastructure needs have been proposed: infrastructure trust funds (with the help of federal contributions) dedicated to capitalizing state infrastructure banks and revolving loan funds; new tax-exempt infrastructure bonds; and public-private partnerships.

Current Funding Of Higher Education Infrastructure

- Funding sources include (in declining order of significance): state funds, tax-exempt bonds, institutional financing, private loans, federal funds, internal borrowing, taxable bonds, and other sources.
- Most education institutions rely primarily on state funding and tax-exempt bonds to finance their capital needs. In recent surveys these were listed as two of the top three preferred sources of financing for all colleges and universities, except medical schools (APPA, 1989).
- However, the current recession will certainly have an impact on the level of state funding. In academic year 1990-91, state funding for higher education grew at the lowest rate since such data was first collected in 1958 (APPA, 1990).
- The 1985 Tax Reform Act limits independent colleges and universities to no more than $150 million in tax-exempt debt at any one time. Due to this, more schools have been forced into the taxable field.

Linking Higher Education to National Infrastructure

Trends indicate that the maintenance deferral rate for higher education facilities has increased since 1988. A consensus of urgency for campus and university physical plant seems to be emerging among higher education administrators.

At the same time, both government officials and private citizens are recognizing the deteriorated condition of our country's infrastructure. Both national infrastructure and higher education facilities are in a crisis. They both require immediate attention and federal support. In addition, they share integral attributes that make it logical for them to be considered together in national debates, governmental processes, and proposed solutions.

National infrastructure and college and university facilities together form the backbone of the nation's economic health and competitiveness. Higher education trains and supplies our scholars, researchers, scientists and engineers, and future leaders and citizens. The nation's roads, bridges, waterways, and other sectors of the traditional infrastructure care for and supply the means necessary to nurture the country's economic and social achievements.

In addition to sharing a mission, national infrastructure and higher education facilities have the same methods and vehicles of financing, and have similar histories of federal funding. Both rely on federal and state government funds, participate in bond markets, and receive loans from banks to fund projects. Both have a financing history in which federal involvement has peaked and subsequently waned, causing a shift of financial responsibility onto other funding sources, especially state governments. These other sources have contributed in important ways, but have been unable to meet the full needs presented by their respective infrastructures. The result is the deteriorating national and higher education infrastructures we have today.

Both infrastructures need a revival in the federal commitment to get them back on their feet, especially to aid in their transition from an era of construction to an era of maintenance, rehabilitation, and replacement. Federal involvement is necessary, for only the federal government has the perspective needed to address national needs fully and equitably and coordinate regional efforts to achieve national goals.

Higher education facility needs may be overlooked by national legislators in part because higher education provides products that are not immediately available for short-term consumption, and that are less tangible than a new bridge or causeway. However, higher education —and the facilities that accommodate it—nurtures products of long-term investment that are indispensable to the nation's well-being. Thus, colleges and universities need a revival of federal involvement, and need the federal government to commit itself to the goal of finding solutions to the severe problem of funding facilities.

Historical precedents exist for the federal government to invest to achieve targeted national goals. For example,

after World War II the federal government achieved the dual goals of stimulating the economy and raising the overall skills of veterans through the enactment of the GI Bill. Also since World War II, two other national goals were accomplished through heavy federal investment—the major national system of highways, and protection of water quality. Together, the highway and water quality systems represent an annual commitment of over $16 billion. In the same way, the federal government can make a commitment to help repair our higher education facilities.

Repairing higher education facilities requires recognition of the need to address two distinct parts of the maintenance problem. The first is fixing the $60 billion maintenance backlog created by inattention to this problem over several decades. The second is ensuring that future maintenance deferrals will not recur on such a scale as currently exists. By establishing sufficient financing methods and vehicles to address future physical plant needs, an equilibrium in facility needs can be achieved.

Models for Federal Intervention

Currently, the federal government offers very modest aid for higher education facilities. The following are the three main programs:

- — Title VII of the Higher Education Act;
- — the academic research facilities program of the National Science Foundation, which provided $20 million in 1990; and
- — the College Construction Loan Insurance Association (also known as Connie Lee), established by the Education Department and the Student Loan Marketing Association. Since early 1987, Connie Lee has initiated more than $1.6 billion of facilities financing.

However, given the enormous size of the deferred maintenance tally, these programs provide only a drop in the bucket. The federal government might consider dramatically expanding these programs, or it might consider other more substantive ways to assist colleges and universities. The following strategies could leverage investments by other sectors, specifically by the states.

First, **a matching grant program could provide funds to help higher education institutions reduce the $60 billion backlog.** Once the maintenance backlog was eliminated the program could be phased out. However, before that, sufficient financing vehicles and methods should be established to fund future maintenance needs, or deferrals will accumulate again.

Second, **the federal government could include colleges and universities in two initiatives for financing national infrastructure** recommended by the Private Sector Advisory Panel on Infrastructure: 1) **tax-exempt infrastructure bonds** that are excluded from the definition of private activity bonds under the federal tax code. This bond market could be opened to higher education institutions for facility financing; and 2) **an Infrastructure Trust Fund** that would allow colleges and universities to participate in state infrastructure banks and revolving loan funds. As a spin off from the second initiative, the federal government could establish a Higher Education Facility Trust Fund mandated specifically for funding higher education facilities. State governments could channel the funds to high priority institutions within the state and leverage federal monies with state funds, or the trust fund could be administered centrally by the federal government.

As shown earlier, maintaining a steady, adequate level of O&M expenditure is an important factor in lowering urgent maintenance needs. When constructing an education building, the extra investment for high quality often pays off in terms of less problematic maintenance needs in the future. Thus, creating a federal higher education facility trust fund could generate dedicated revenues. Similar to existing highway, airport, and waterway trust funds, a higher education facility trust fund could help greatly reduce the physical plant problem. As studies have shown, because they are less vulnerable to the tides of politics in the budget-making process, dedicated revenues from trust funds are a more reliable source of revenue than general designated outlays.

SUMMARY AND IMPLICATIONS

Current financing vehicles are inadequate to fund the necessary overhaul of higher education facilities, just as they were unable to prevent the current levels of deferred maintenance from occurring in the first place. Therefore, all parties with a stake in higher education should seriously pursue alternative methods of financing or significantly expand current programs.

Institutions must not only address deferred maintenance needs, but also the need for adaptation and renewal of facilities. This second problem has been addressed by the National Association of College and University Business Officers (see Resources).

With the contraction of state budgets and other funding sources due to the recession, facilities maintenance is further threatened. As institutions face budget cuts due to shrinking outside funds, it is crucial that facilities and long-term management remain high among college and university priorities.

With structural changes such as those suggested in this brief, the federal government could work with states and institutions to enhance the status of higher education facilities.

As we focus national debate on our water resources and transportation systems, and as solutions for national infrastructure problems are devised, we must consider higher education's libraries, classrooms, and research laboratories and include them in such debates. As the nation begins to restore its economic competitiveness, higher education will play a crucial role. Only the federal government, with its broad perspective on the problems facing the nation, can mold an effective and long-term national infrastructure investment policy that draws on existing structures at the state and institutional level, and assures that higher education institutions have the physical facilities necessary for their fullest contribution to national goals.

RESOURCES

1. The Association of Higher Education Facilities Officers, formerly known as the Association of Physical Plant Administrators of Universities and Colleges, monitors the facilities needs of the nation's higher education institutions. Recently, the association conducted a survey of institutions to determine the estimated cost of adhering to federal regulations covering areas such as asbestos removal, handicapped accessibility, storage tanks, etc. For more information, contact Association of Higher Education Facilities Officers, 1446 Duke Street, Alexandria, VA 22314. (703) 684-1446.

2. The National Science Foundation (NSF) administers the Academic Research Facilities program, which provides funds to renovate facilities. Also, NSF conducted a survey of research institutions' facilities needs last year. For more information, contact the National Science Foundation, 1800 G Street NW, Washington, D.C. 20550. (202) 357-9808.

3. The National Association of College and University Business Officers (NACUBO) has studied this issue in several reports, including *Managing the Facilities Portfolio* (available for $25 for members, $37 for nonmembers) and *Financial Planning Guidelines for Facility Renewal and Adaption* (available for $15 for members, $21 for nonmembers). For more information, contact the National Association of College and University Business Officers, Suite 500, One Dupont Circle NW, Washington, D.C. 20036. (202) 861-2500.

4. The Winter 1989 issue of *Educational Record*, published by the American Council on Education, provides an excellent overview of the condition of higher education facilities. Contact the American Council on Education, Publications, One Dupont Circle NW, Washington, D.C. 20036. (202) 939-0380.

5. The Government-University-Industry Research Roundtable (GUIRR) co-sponsored a conference on research facilities financing in 1989, and published *Research Facility Financing: Near-Term Options* in 1991. This paper presents options on how research universities and institutions can pay for facilities maintenance and renewal, with options aimed at federal, state, and local governments, as well as the institutions themselves. For more information, contact the Government-University-Industry Research Roundtable, 2101 Constitution Ave. NW, Washington, D.C. 20418.

6. The National Council on Public Works Improvement, a congressionally-mandated commission, issued a three-part document titled, *Fragile Foundations: A Report on America's Public Works*. The report examined the nation's infrastructure, offered policy recommendations, and suggested a number of financing strategies for facilities repair and renewal. The report is available for $13 from the Government Printing Office (order #052003010984). To order, contact the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402-9325.

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ENDNOTES

1. *The Decaying American Campus: A Ticking Time Bomb.* A Joint Report of the Association of Physical Plant Administrators of Universities and Colleges and the National Association of College and University Business Officers (NACUBO) in cooperation with Coopers & Lybrand. 1989. p. 16. $60 billion may be a conservative estimate. It is based on a 1974 survey that found 20 percent of all space was in need of replacement and renewal. If it is assumed that the need has grown to 25 percent of all space, then the capital renewal and replacement value is $75 billion.
2. *ibid.* 12. The $20.5 billion figure is made up of two components: $14.4 billion for accumulated urgent need up to 1987; and $6.1 billion to repair urgent needs generated in 1988.
3. *ibid.* 15. There has been no other national study on replacement and renewal needs of higher education total space since 1974. From its own survey, APPA determined that conditions have worsened since its study.
4. Based on data from the Equal Employment Opportunity Commission, EEO-6 Detail Summary Reports for 1975 and 1989.
5. This cost estimate may be too conservative since institutions responded to the survey before they were able to determine the costs of complying with the 1990 Americans with Disabilities Act.
6. The bulk of federal funding for infrastructure is concentrated on the Highway Trust Fund and the Airport and Airways Trust Fund; together, these funds comprised around 70 percent of the federal infrastructure funding sources in 1987. These trust funds are a reliable source of dedicated revenue for their respective programs.
7. Congressional Budget Office. *How Federal Spending for Infrastructure and Other Public Investments Affects the Economy.* Washington, D.C.: U.S. Government Printing Office, 1991. Nearly all federal outlays are generated by the Highway Trust Fund.

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